

## LISTING OF THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) An arrangement for controlling a combustion engine ~~whereby~~  
wherein

the combustion engine (1) comprises a combustion chamber (3), a movable piston in the combustion chamber and the piston being movable (4) ~~adapted to compressing compress~~ a fuel mixture in the combustion chamber (3) so that self-ignition of the fuel mixture takes place, a crankshaft (5) connected to and driven by movements of the piston; (4);

an inlet valve (8) to the combustion chamber (3) and an exhaust valve (11) from the combustion chamber; (3), ~~which arrangement comprises~~

a control unit operable for (19) ~~adapted to~~ controlling the self-ignition of the fuel mixture to an optimum crankshaft angle ( $\text{cad}_{\text{iopt}}$ ) of the crankshaft within a load range ( $L_{\text{tot}}$ ), characterised in that ~~said wherein the~~ load range ( $L_{\text{tot}}$ ) ~~can be~~ is divided into at least two subranges ( $L_{\text{II}}$ ,  $L_{\text{III}}$ ) and the control unit (19) ~~is adapted to~~ operable for controlling the self-ignition of the fuel mixture towards ~~an the~~ optimum crankshaft angle ( $\text{cad}_{\text{iopt}}$ ) of the crankshaft within a first one of ~~said the~~ subranges ( $L_{\text{II}}$ ) by ~~means of~~ a strategy (II) ~~which entails of~~ varying the effective compression ratio ( $c$ ) in the cylinder (2) ~~being varied~~ within a range bounded downwards by a lowest acceptable compression ratio ( $c_{\text{min}}$ ), and within a second ~~subrange one of the subranges~~ ( $L_{\text{III}}$ ) by ~~means of~~ a strategy (III) which entails leading cooled exhaust gases ( $\text{ceg}$ ) ~~being led~~ to the combustion chamber (3) in a quantity ~~such that it becomes possible~~ also enabling within the second subrange ( $L_{\text{III}}$ ) ~~to control of~~ the self-ignition of the fuel mixture towards ~~an the~~ optimum crankshaft angle ( $\text{cad}_{\text{iopt}}$ ) of the crankshaft by variation of the effective compression ratio ( $c$ ) within the range bounded downwards by the lowest acceptable compression ratio ( $c_{\text{min}}$ ).

2. (Currently Amended) An arrangement according to claim 1, wherein characterised in that the control unit (19) is adapted to regulating the effective compression ratio ( $c$ ) in the cylinder (2) by initiating variable closure of the inlet valve ~~closure~~ ( $\text{ivc}$ ).

3. (Currently Amended) An arrangement according to ~~any one of the foregoing claims, characterised in that the arrangement comprises~~ claim 2, further comprising a hydraulic control system (18a) operable for controlling the variable inlet valve closure (ivc).

4. (Currently Amended) An arrangement according to ~~any one of the foregoing claims, characterised in that the arrangement comprises a return line (13) extending from~~ claim 1, further comprising an exhaust line (12) of the combustion engine from the exhaust valve to an inlet line (7) to the inlet valve for air supply to the combustion chamber, and a return line extending from the exhaust line to the inlet line (3).

5. (Currently Amended) An arrangement according to claim 4, ~~characterised in that said~~ wherein the return line (13) comprises a valve (14) for controlling the supply of exhaust gases to the inlet line (7).

6. (Currently Amended) An arrangement according to claim 3 ~~or 5, characterised in that~~ 4, wherein the return line (13) further comprises a cooler (15) operable for cooling the exhaust gases before they reach the inlet line (7).

7. (Currently Amended) An arrangement according to ~~any one of the foregoing claims, characterised in that the arrangement comprises~~ claim 1, further comprising a first sensor (16) for detecting a parameter (p) which indicates the start of a combustion process in the combustion chamber (3), and a second sensor (17) for estimating the crankshaft angle (cad) of the crankshaft combustion engine (1), and the control unit (19) is adapted to operable for determining the crankshaft angle (cad,) for the start of the combustion process.

8. (Currently Amended) An arrangement according to claim 7, ~~characterised in that said~~ wherein the first sensor is a pressure sensor (16) ~~which detects~~ operable for detecting the pressure (p) in the combustion chamber (3).

9. (Currently Amended) An arrangement according to claim 7, ~~wherein or 8, characterised~~ in that the control unit (19) ~~is adapted to~~ is operable for comparing the estimated crankshaft angle ( $\text{cad}_i$ ) at the self-ignition of the combustion process with stored information concerning the optimum crankshaft angle ( $\text{cad}_{\text{opt}}$ ) for self-ignition of the combustion process and ~~to for~~ using that information for controlling the self-ignition of the following combustion process.

10. (Currently Amended) An arrangement according to ~~any one of the foregoing claims,~~ characterised in that the arrangement comprises claim 1, further comprising an injection nozzle operable (10) for injecting fuel ~~injection~~ into the combustion chamber (3) when the inlet valve (8) is open.

11. (Currently Amended) A method for controlling a combustion engine ~~whereby wherein~~ the combustion engine (1) comprises a combustion chamber (3), a movable piston (4) ~~adapted to compressing in the combustion chamber and the piston being movable to compress~~ a fuel mixture in the combustion chamber (3) so that self-ignition of the fuel mixture takes place, a crankshaft connected to and (5) driven by movements of the piston; (4);

an inlet valve (8) to the combustion chamber (3) and an exhaust valve (11) from the combustion chamber;

(3), ~~which the method comprises the step of comprising:~~

controlling the self-ignition of the fuel mixture towards an optimum crankshaft angle ( $\text{cad}_{\text{opt}}$ ) of the crankshaft within a load range ( $L_{\text{tot}}$ ), ~~characterised in that is said load range ( $L_{\text{tot}}$ ) can be divided into at least two first and second subranges ( $L_{\text{II}}$ ,  $L_{\text{III}}$ ); and the method comprises the steps of~~ controlling the self-ignition of the fuel mixture towards an the optimum crankshaft angle ( $\text{cad}_{\text{opt}}$ ) within ~~one of said subranges the first subrange ( $L_{\text{II}}$ ) by means of a strategy (II) which entails of~~ varying the effective compression ratio ( $c$ ) in the cylinder (2) ~~being varied~~ within a range bounded downwards by a lowest acceptable compression ratio ( $c_{\text{min}}$ ), and within the second subrange ( $L_{\text{III}}$ ) by ~~means of a strategy (III) which entails of leading~~ cooled exhaust gases ( $\text{ceg}$ ) ~~being led~~ to the combustion chamber (3) in a quantity ~~such that it becomes possible also enabling~~ within the second

subrange ( $L_{III}$ ) ~~to control of~~ the self-ignition of the fuel mixture towards ~~an~~ the optimum crankshaft angle ( $\text{cad}_{\text{opt}}$ ) of the crankshaft by variation of the effective compression ratio ( $c$ ) within the range bounded downwards by the lowest acceptable compression ratio ( $c_{\text{min}}$ ).

12. (Currently Amended) A method according to claim 11, further comprising characterised ~~by the step of~~ regulating the effective compression ratio in the cylinder (2) by initiating variable inlet valve closure (ivc).

13. (Currently Amended) A method according to claim 12, ~~characterised by the step of~~ further comprising controlling the variable inlet valve closure (ivc) by ~~means of~~ a hydraulic control system (18a).

14. (Currently Amended) A method according to ~~any one of claims 11-13 above,~~ characterised by the step of claim 11, further comprising leading ~~said~~ cooled exhaust gases (ceg) to the combustion chamber (3) via a return line (13) extending from an exhaust line (12) of the combustion engine from the exhaust valve to an inlet line to the inlet valve (7) for air supply to the combustion chamber (3).

15. (Currently Amended) A method according to claim 14, ~~characterised by the step of~~ further comprising valve controlling the supply of exhaust gases to the inlet line (7) ~~by means of a valve (14).~~

16. (Currently Amended) A method according to claim 14, further comprising ~~or 15,~~ ~~characterised by the step of~~ cooling the exhaust gases before they reach the inlet line (7) ~~by means of a cooler (15).~~

17. (Currently Amended) A method according to ~~any one of claims 11-16 above,~~ characterised by the steps of claim 11, further comprising determining the crankshaft angle ( $\text{cad}_i$ ) at the start of the combustion process by detecting a parameter ( $p$ ) which is related to the combustion

process in the combustion chamber (3), and ~~of~~ by detecting the crankshaft angle (cad) of the combustion engine (1).

18. (Currently Amended) A method according to claim 17, ~~characterised in that said~~ wherein the parameter detected is the pressure (p) in the combustion chamber (3).

19. (Currently Amended) A method according to claim 17, ~~further comprising or 18,~~ characterised by the steps of comparing the estimated crankshaft angle (cad<sub>i</sub>) at the start of the combustion process with stored information concerning the optimum crankshaft angle (cad<sub>iopt</sub>) for the start of the combustion process, and ~~of~~ using that information for controlling the self-ignition of the following combustion process.

20. (Currently Amended) A method according to ~~any one of claims 11-19 above,~~ characterised by the step of claim 11, further comprising injecting fuel into the combustion chamber (3) ~~via an injection nozzle (10)~~ when the inlet valve (8) is open.